AMENDMENTS TO THE CLAIMS

1-4. (Cancelled)

5. (Currently amended) A method to control etch profile while etching a microelectronics substrate, the method comprising:

providing an etch chamber and a microelectronics substrate disposed therein; and

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pulsing into said etch chamber at least one gas wherein said pulsing imparts a time varying flow rate to said gas for a plurality of periods of said time varying flow rate; wherein the pulsing provides for the alternating steps of:

etching said microelelectronics substrate with said at least one gas; and

forming a deposit with said at least one gas on a side surface of the microelectronics substrate, the deposit preventing additional etching of the side surface of said microelelectronics substrate underneath the deposit;

wherein said pulsing is applied so that said at least one gas does not reach steady state concentration within said etch chamber in said plurality of periods.

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6. (Original) The method as defined in Claim 5, wherein said etch chamber is associated with a high density etch tool.

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7. (Previously amended) The method as defined in Claim 5, wherein said substrate is selected from the group consisting of an oxide film, a resist, a multi-layer resist, a metal, a metal alloy, an aluminum alloy, a refractory metal, tungsten, an electrical conductor, and at least one polysilicide.

8. (Original) The method as defined in Claim 5, wherein said pulsing is applied so that said at least one gas reaches steady state concentration within said etch chamber in at least one of said plurality of periods.

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9. (Cancelled)

10. (Original) The method as defined in Claim 5, wherein said pulsing is applied at a duty cycle range selected from the group consisting of:

from about 20% to about 80% duty cycle;

from about 30% to about 70% duty cycle; and

from about 40% to about 60% duty cycle.

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11. (Original) The method as defined in Claim 5, wherein said at least one gas comprises a gas selected from the group consisting of CHF_3, CH_2F_2, a halogenated hydrocarbon, a hydrofluorocarbon, CO, CO_2, O_2, Ar, a fluorocarbon, CF_4, C_4F_8, C_5F_8, BCl_3, Cl_2.

12. (Original) The method as defined in Claim 5, further comprising flowing a second gas comprising at least one of the gases nitrogen, oxygen and an inert gas into said etch chamber.

13. (Original) The method as defined in Claim 5, wherein said time varying flow rate varying within a range selected from the group consisting of:

between a high flow rate value of about 30 sccm to a low flow rate value of about 15 sccm;

between a high flow rate value of about 27 sccm to a low flow rate value of about 18 sccm;

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between a high flow rate value of about 25 sccm to a low flow rate value of about 20 sccm;

between a low flow rate value of about 20 sccm to a high flow rate value of about 30 sccm; and

between a low flow rate value of about 15 sccm to a high flow rate value of about 20 sccm.

14. (Original) The method as defined in Claim 13, wherein each of the high and low flow rate values has about the same time duration.

15. (Original) The method as defined in Claim 5, wherein said pulsing is controlled with at least one piezoelectric valve.

16. (Original) The method as defined in Claim 5, wherein said etching is a process selected from the group consisting of:

an anisotropic self-aligned contact etch; and

an anisotropic high aspect ratio contact etch, wherein the aspect ratio is at least 4 to 1.

17. (Original) The method as defined in Claim 5, further comprising, prior to providing said etch chamber, patterning a layered substrate with a photoresist mask to form said microelectronics substrate.

18. (Original) The method as defined in Claim 17, wherein said layered substrate comprises an oxide layer and a nitride layer disposed on a silicon layer.

C5 cont

19. (Original) The method as defined in Claim 18, wherein said etching halts on said silicon layer.

20. (Original) The method as defined in Claim 5, further comprising flowing an etchant gas into said etch chamber.

21. (Original) The method as defined in Claim 20, wherein said etchant gas is selected from the group consisting of a polymer forming gas, an etching gas, and a fluorocarbon.

22. (Original) The method as defined in Claim 17, wherein said layered substrate comprises at least an oxide layer; the method further comprising flowing an etchant gas into said etch chamber, wherein said etchant gas selectively removes at least a portion of said oxide layer.

23. (Previously amended) The method as defined in Claim 5, wherein:

said gas is a protective layer forming gas, wherein the protective layer comprises a polymer;

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said microelectronics substrate has at least an oxide layer; and

said gas selectively removes at least a portion of said oxide layer and a vertical profile in said oxide layer.

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24. (Original) The method as defined in Claim 23, wherein said oxide layer comprises BPSG.

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25. (Previously amended) The method as defined in Claim 41, wherein said microelectronics structure includes a nitride layer.

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26. (Original) The method as defined in Claim 25, wherein said nitride layer is at least one of a silicon nitride layer and a silicon oxynitride layer.

27. (Currently amended) A method of etching oxide using a polymer, the method comprising:

disposing a patterned semiconductor substrate in a high density plasma etcher, said substrate comprising a silicon layer with a gate stack structure disposed thereon, said gate stack structure being encapsulated by silicon nitride, and layered with an oxide;

providing a hydrofluorocarbon gas into said high density etcher;

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selectively removing portions of said oxide by pulsing a fluorocarbon gas; wherein:

said pulsing imparts a time varying flow rate to said fluorocarbon gas for a plurality of periods of said time varying flow rate<u>, wherein said hydrofluorocarbon gas is pulsed in a range from about 0 sccm to about 25 sccm and is at least intermittently at a higher concentration than said fluorocarbon gas;</u>

<u>said hydrofluorocarbon gas removes portions of said oxide</u>; and

said fluorocarbon gas forms a protective layer; and

wherein the pulsing of said fluorocarbon gas causes said hydrofluorocarbon gas to have cyclical concentrations within said high density etcher.

[28. (Cancelled)]

29. (Previously amended) The method as defined in Claim 27, wherein said hydrofluorocarbon gas is pulsed into said high density etcher so that the hydrofluorocarbon gas pulses alternate with the fluorocarbon gas pulses and wherein pulsing said hydrofluorocarbon gas imparts a time varying flow rate to said hydrofluorocarbon gas for a plurality of periods of said time varying flow rate.

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C12 30. (Original) The method as defined in Claim 29, wherein said hydrofluorocarbon gas is pulsed into said high density etcher with at least one piezoelectric valve.

31. (Currently amended) A etching method comprising:

forming a photoresist pattern on a microelectronics substrate that includes both an oxide layer and a nitride layer disposed on a silicon layer;

providing an etch chamber and said microelectronics substrate disposed therein;

pulsing into said etch chamber at least one gas suitable for forming a deposit on at least a portion of said microelectronics substrate, wherein:

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said deposit is selected from the group consisting of an oxide film, a resist, a multi-layer resist, a metal, a metal alloy, an aluminum alloy, a refractory metal, tungsten, an electrical conductor, polysilicon, and at least one polysilicide;

said at least one gas comprises a gas selected from the group consisting of a halogenated hydrocarbon, and a fluorocarbon;

said pulsing imparts a time varying flow rate to said gas for a plurality of periods of said time varying flow rate;

said pulsing is applied at a duty cycle range selected from the group consisting of:

from about 20% to about 80% duty cycle;

from about 30% to about 70% duty cycle; and

from about 40% to about 60% duty cycle;

said time varying flow rate varies within a range selected from the group consisting of:

between a high flow rate value of about 30 sccm to a low flow rate value of about 15 sccm;

between a high flow rate value of about 27 sccm to a low flow rate value of about 18 sccm;

between a high flow rate value of about 25 sccm to a low flow rate value of about 20 sccm;

between a high flow rate value of about 20 sccm to a low flow rate value of about 30 sccm; and

between a high flow rate value of about 15 sccm to a low flow rate value of about 20 sccm;

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etching said microelelectronics substrate with said a second gas during said pulsing, wherein:

wherein said second gas is at least intermittently at a higher concentration than said first gas;

said etching halts on said silicon layer;

said second gas is selected from the group consisting of a polymer forming gas, a polymer etching gas, and a fluorocarbon; and

said second gas selectively removes at least a portion of said oxide layer.

32. (Original) The method as defined in Claim 31, wherein said pulsing is applied so that said at least one gas reaches steady state concentration within said etch chamber in at least one of said plurality of periods.

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33. (Original) The method as defined in Claim 31, wherein said pulsing is applied so that said at least one gas does not reach steady state concentration within said etch chamber in said plurality of periods.

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34. (Previously amended) The method as defined in Claim 31, further comprising flowing a gas comprising at least one of the gases nitrogen, oxygen and an inert gas into said etch chamber.

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35. (Currently amended) An etching method comprising:

exposing a substrate to a plurality of gases, wherein at least one of said gases is pulsed and said pulsing imparts a time varying flow rate to said at least one gas for a plurality of periods of said time varying flow rate; and wherein

at least one of said gases comprises an etchant gas selected from the group consisting of a hydrofluorocarbon and a fluorocarbon; and

at least one of said gases comprises a polymer forming gas for depositing a protective layer, <u>wherein said etchant gas is at least intermittently at a higher concentration than said polymer forming gas</u>.

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36. (Original) The method as defined in Claim 35, wherein

at least one of said gases comprises a gas that modifies the deposition of said protective layer; and

at least one of said gases comprises an etch modifying gas.

36. (Original) The method as defined in Claim 35, wherein said etchant gas comprises one gas selected from the group consisting of a hydrofluorocarbon and a fluorocarbon.

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~~37. (Cancelled)~~

38. (Previously amended) The method as defined in Claim 35, wherein said gas for depositing a protective layer comprises one gas for depositing a polymer.

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39. (Previously amended) The method as defined in Claim 36, wherein said gas that modifies the deposition of a protective layer is selected from the group consisting of CO, CO_2, and O_2.

40. (Previously amended) The method as defined in Claim 36, wherein said etch modifying gas is selected from the group consisting of BCl_3 and Cl_2.

41. (Currently amended) A method to control etch profile while etching a microelectronics substrate, the method comprising:

providing an etch chamber and a microelectronics substrate disposed therein;

pulsing into said etch chamber a carbon containing polymer gas suitable for:

forming a deposit on at least a portion of said microelectronics substrate; and

etching said microelelectronics substrate;

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wherein said pulsing imparts a time varying flow rate to said gas for a plurality of periods of said time varying flow rate, thereby causing said gas to alternately form a deposit on at least a portion of said microelectronics substrate and etch said microelelectronics substrate and wherein said pulsing is applied so that said carbon containing polymer gas does not reach steady state concentration within said etch chamber in said plurality of periods.

42. (Original) The method as defined in Claim 5, further comprising flowing nitrogen gas into said etch chamber.

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43. (Original) The method as defined in Claim 5, wherein said layered substrate comprises a thermal oxide layer disposed on a silicon layer.

44. (Original) The method as defined in Claim 43, wherein said etching halts on said thermal oxide layer disposed on said silicon layer.

45. (New) A method to provide increased gas flow rate tolerances while etching a microelectronics substrate, the method comprising:

providing an etch chamber and a microelectronics substrate disposed therein;

providing at least one gas for introduction into the etch chamber, the at least one gas capable of both etching the microelelectronics substrate and forming a deposit on a side surface of the microelectronics substrate, wherein use of the at least one gas at a uniform flow rate provides a desired etch profile in the microelectronics substrate at a flow rate selected within a first process window; and

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pulsing into the etch chamber the at least one gas wherein the pulsing imparts a time varying flow rate to the gas for a plurality of periods of the time varying flow rate, wherein the pulsing provides for the alternating steps of:

etching the microelelectronics substrate with the at least one gas; and

forming a deposit with the at least one gas on a side surface of the microelectronics substrate, the deposit preventing additional etching of the side surface of the microelelectronics substrate underneath the deposit;

wherein the pulsing enables the selection of flow rates from within a second process window that is larger than the first process window while still providing the desired etch profile in the microelectronics substrate.

46. (New) The method as defined in Claim 45, wherein the pulsing is applied so that the at least one gas does not reach steady state concentration within the etch chamber in the plurality of periods.